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PULPING AND NONPULPING CORDWOOD VOLUME IN THE SOUTHWEST ALABAMA SURVEY AREA

By

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* - This is an advance release of Forest Survey data that will be included in complete reports to be published later. This information is subject to correction or amplification as computations proceed.

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PULPING AND NONPULPING CORDWOOD VOLUME

IN THE SOUTHWEST ALABAMA SURVEY AREA

This report deals with the volume and character of cordwood in an area that embraces twelve counties in southwestern Alabama. This area, shown in figure 1, covers 8,119,000 acres. Although the region lies wholly within the Gulf Coastal Plain, its topographic features vary markedly. The broad, flat areas commonly found in the South Atlantic and Gulf Coast region occur to only a limited extent along the coasts of Baldwin and Mobile Counties. Adjoining is a broad belt of forested rolling uplands extending northward to the Black Prairie Belt in Sumpter and Morengo Counties. These highlands reach their greatest elevation, 350-400 feet, in Choctaw, Clark and Monroe counties where they are locally known as "mountains". Through this rolling hill country and draining the greater portion of it flow the two main water courses of the region, the Tombigbee and Alabama rivers. The two valleys join at the southern end of Clark County to form a wide bottom land, the deltas of the Mobile and Tensas Rivers. These rivers flow south through alluvial low land averaging ten miles in width to Mobile Bay, a distance of about forty miles.

Five major trunk line railroads, with terminal facilities in Mobile, traverse the Southwest Alabama area. They are: The Gulf, Mobile and Northern; Mobile and Ohio; Louisville and Nashville; Southern; and the Alabama, Tennessee and Northern. Another large system, the St. Louis-San Francisco, also functions in the area, with its terminal, however, at Pensacola, Fla. In addition to these, at least seven smaller railroads also operate in the area, thus making it one of the best sections in the South with respect to railway transportation facilities. The Mobile, Tombigbee, and Alabama Rivers are used extensively for barge transportation of coal from the Birmingham coal fields, and for the movement of pulpwood, logs, and other forest products. Mobile has excellent state-owned docks and other deep water shipping facilities, and is located on the Intercoastal Canal.

The tabular figures on land area and wood volume presented in this report are based on data gathered by the Forest Survey between August 1934 and June 1935. They are preliminary estimates only and are subject to correction or modification when final computations are completed; these changes, however, are not likely to be extensive or important. The Forest Survey, an activity of the Southern Forest Experiment Station, maintains a large field and office force for the purpose of securing and analyzing data on the South's timber stands. In the Southwest Alabama area, three-man crews of specially trained timber estimators measured the timber and recorded the forest and land-use conditions on a series of more than 10,000 one-quarter-area sample plots systematically established at intervals of 660 feet on parallel compass lines ten miles apart. The Forest Survey has also accumulated further data covering the growth, the use, and the industrial aspects of the forest in this area. As soon as these data have been analyzed and interpreted, a basis will have been established for determining the relative volumes of pulpwood, sawtimber, and other forest products that the area can perpetually produce. These findings will be published as part of a comprehensive report on the area.

In the present cordwood release the Forest Survey cannot attempt to qualify the extent to which the wood volume of this area should be used for pulp. The prior claims of other forest industries on wood as a raw material must be considered before any planned expansion of the pulpwood industry is undertaken. Moreover, the future timber supply must be safeguarded by building up an ample growing stock. The lumber industry of the future, as well as other wood-using industries, must depend largely upon the growth of young trees. If all the trees between 6 and 14 inches in diameter

were cut for pulpwood now, the future industrial development of this area would be jeopardized.

Land Area

Among the major land-use classes, the area devoted to forests is the most extensive; 70.6 percent of the land surface is in some stage of forest growth. Nearly three-fourths of the forest area is in the rolling uplands; the remainder is in swamps, river bottoms, and flatwoods. The flatwoods, however, account for only four percent of the total productive forest area. The area of nonproductive forest is strikingly low. Although nearly 20 percent of this survey area is in cultivation, it is evident from table 1 that land is going out of cultivation more rapidly than new land is being cleared for cultivation.

TABLE 1. -- *Area*[1] *classified by major land uses*

Land-use classes	Area in acres		Percent of total area	
Forest:				
Productive	5,729,700		70.6	
Nonproductive [2]	2,300		neg.	
Total forest		5,732,000		70.6
Agricultural:				
In cultivation:				
Old cropland [3]	1,548,800		19.1	
New cropland [4]	23,800		.3	
Out of cultivation:				
Idle [5]	166,600		2.0	
Abandoned [6]	135,300		1.7	
Improved pasture [7]	247,500		3.0	
Total agricultural		2,122,000		26.1
Other:				
Prairie)				
Marsh)				
Waterways)		265,100		3.3
Towns and villages)				
Roads, railroads, etc.)				
Total area		8,119,100		100.0

[1] Does not include meanderable water area.

[2] Nonproductive forest land is forest area that has not the qualities essential for the growth of commercial timber species.

[3] Land cultivated at least five years and on which a farm crop was raised within two years prior to the date of survey.

[4] Land converted from forest to cropland within five years prior to survey date.

[5] Cultivated land that has been idle for two years or more, but has not reached the abandoned stage.

[6] Land once cultivated but showing distinct evidence of having been abandoned for agricultural crop production; no attempt has been made to maintain it as improved pasture.

[7] Cleared or open land under fence used primarily for grazing; a real attempt has been made to produce and maintain a sod.

Under the system of sampling used in the collection of survey data, items that are of infrequent occurrence and relatively small in quantity cannot be determined with as high a degree of accuracy as is obtainable for items that occur more frequently and in substantially greater quantities. Small tabular figures, therefore, are to be taken as showing, not the exact magnitudes of the items involved, but their relative magnitudes in comparison with those of other items.

Forest Area

The extent of productive forest in this area is approximately 5,729,700 acres. Table 2 classifies this forest area by forest conditions and forest type groups. Forest conditions are defined as follows:

Old growth: Stands composed predominantly of saw-log-sized trees that have the characteristics of the original mature trees found in the region. ("Saw-log-sized" signifies a minimum diameter of 13.0 inches outside of bark at breast height in the hardwood species, 9.0 inches in the pine species).

Uncut: Old-growth stands from which less than 10 percent of the volume has been cut.

Partly-cut: Old-growth stands from which 10 percent or more of the volume has been cut, but in which the remaining volume per acre in saw-log-sized trees is at the rate of at least 1,000 board feet of hardwood or hardwood and pine mixed, or 600 board feet of pine.

Second growth: Stands that have succeeded the original old growth as a result of forest cutting or other causes.

Saw-log size
Uncut: Second-growth stands from which less than 10 percent of the saw-log-sized trees have been cut, and in which the volume per acre is at the rate of at least 600 board feet.

Partly-cut: Second-growth stands from which 10 percent or more of the saw-log-sized trees have been cut, but in which the remaining volume per acre is at the rate of at least 400 board feet.

Under saw-log size
Uncut: Second-growth stands in which the volume per acre of saw-log-sized timber is at the rate of less than 600 board feet. Less than 10 percent of the trees under saw-log size have been cut.

Partly-cut: Second-growth stands in which the volume per acre of saw-log sized timber is at the rate of less than 400 board feet. Ten percent or more of the trees under saw-log size have been cut.

Clear cut: Old-growth and second-growth stands that have been cut over and in which an insufficient quantity of young growth has come in to classify the stands either as second growth or as reproduction.

Reproduction: Areas of young growth bearing seedlings less than one inch in diameter at the rate of more than 80 per acre.

Table 2 shows that second-growth timber stands occupy over 70 percent of the forest area in all three major type groups. Seventeen percent of the forest area is still in old-growth timber, the largest proportion of which is in the hardwood types. The second-growth pines, which are almost equally divided between the two major pine types, occupy more than half the total acreage in the forest area. Loblolly and shortleaf pine stands, however, are slowly taking over areas that were formerly occupied by virgin stands of longleaf pine timber. Only 6 percent of the entire forest area has been cut over and has not as yet restocked; this condition is found mainly in the longleaf and slash pine types. Figure 1 maps the geographic distribution and extent of the major forest types.

TABLE 2. -- *Productive forest area by forest conditions and forest type groups*

Forest conditions	Forest type groups desiginated by predominant species			Total	Percent of total productive forest area
	Longleaf and slash pine	Loblolly and shortleaf pine	Hardwood		
	Acres				
Old-growth:					
Uncut	78,500	50,200	124,900	253,600	4.4
Partly-cut	342,600	90,500	305,700	738,800	12.9
Total	421,100	140,700	430,600	992,400	17.3
Second-growth:					
Saw-log size:					
Uncut	472,600	707,800	210,300	1,390,700	24.3
Partly-cut	74,400	250,200	67,800	392,400	6.8
Under saw-log size:					
Uncut	968,500	647,000	521,200	2,136,700	37.3
Partly-cut	62,400	32,200	20,100	114,700	2.0
Total	1,577,900	1,637,200	819,400	4,034,500	70.4
Clear-cut	359,600	4,600	2,400	366,600	6.4
Reproduction	241,500	67,000	27,700	336,200	5.9
Total productive forest area	2,600,100	1,849,500	1,280,100	5,729,700	100.0
Percent of total productive forest area	45.4	32.3	22.3	100.0	

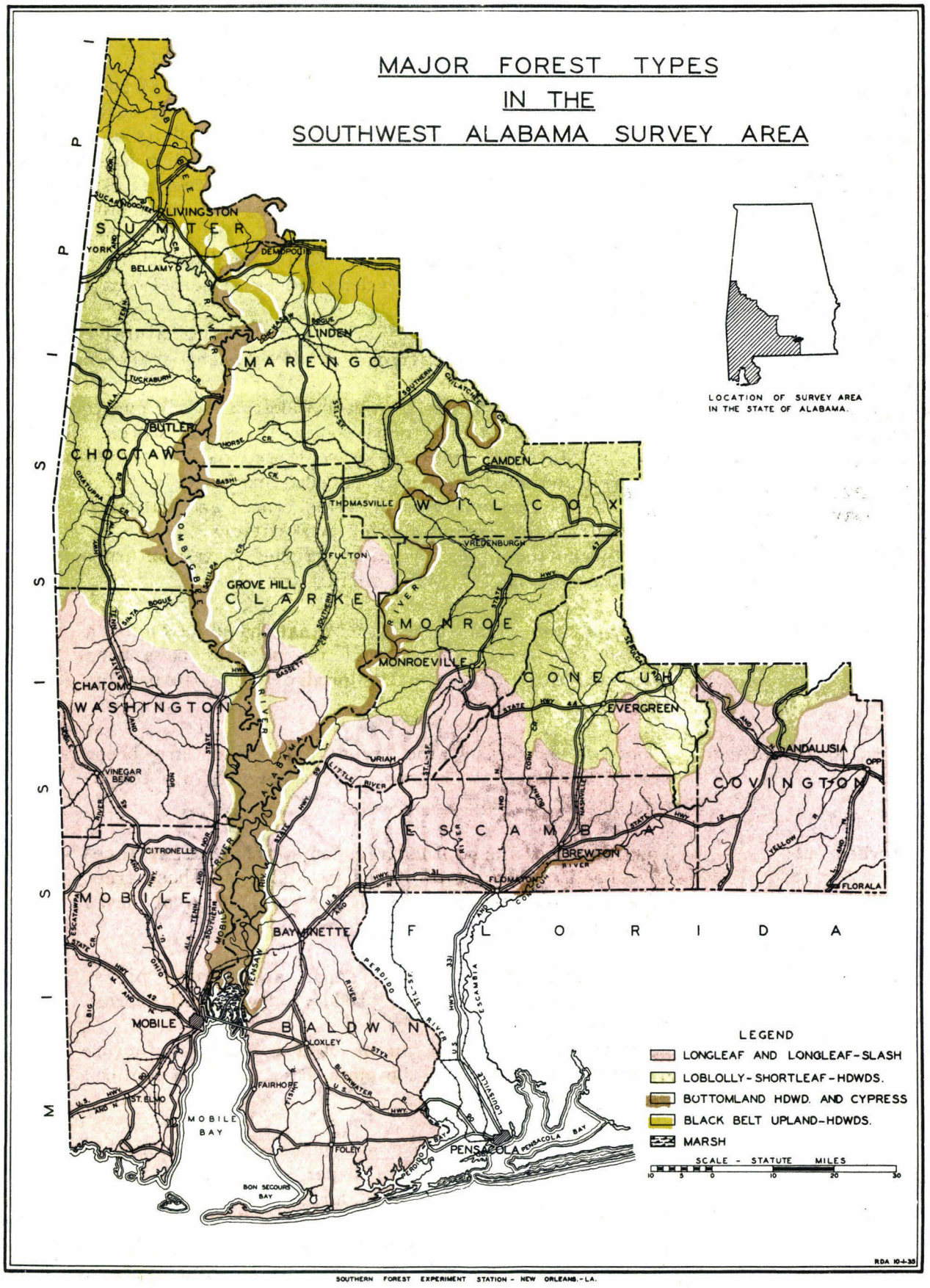

FIGURE 1. -- Geographical distribution of major forest types

Volume Estimate

Estimates of wood volume are expressed in standards cords, 4 x 4 x 8 feet, containing 90 cubic feet of pine wood (including bark) and 80 cubic feet of hardwood (including bark). These estimates cover only the stemwood 4.0 inches or larger in diameter in all live, sound trees, the outside-of-bark diameter of which is at least 5.0 inches at breast height. The estimates therefore disregard altogether all trees less than 5.0 inches in diameter at breast height, and exclude all stemwood less than 4.0 inches in diameter outside of bark, as well as all limbwood. No deduction was made for woods cull--that part of the tree that would be left in the woods because of rot, fire-scar, crook, bad knots, or other defects. While final computation of woods cull has been not made, it is believed that the deduction will be between three and six percent in cubic volume.

Although much of the Southwest Alabama survey area is within the natural range of longleaf and slash pines, it is only on the fringe of the present active naval stores belt, and fewer turpentine operations are carried on there than in areas farther east. The turpentine pine forests of this area, which make up nearly one-fourth of the total cordwood volume, therefore offer a good source for naval stores. The Forest Survey is in no position to state definitely at present what part of the volume may be required for naval stores and what part may be used exclusively for pulp. Such apportionment must await the further analysis of naval stores and pulpwood demands in this area and will appear in subsequent Survey publications.

The several classes of turpentine pines, as distinguished from nonturpentine pines and hardwoods, are explained by the following definitions:

Turpentine pines:	
Round:	Longleaf and slash pine trees that have never been worked for naval stores; that is, no cups have been hung nor faces made for the production of turpentine and rosin.
Working and idle:	Longleaf and slash pine trees that either are being worked for naval stores at present, or are in a temporary period of rest.
Worked-out:	Longleaf and slash pine trees on which as many faces have been worked as the trees will stand. These trees have served their purpose in the production of naval stores and are available for other uses.
Nonturpentine pines:	Loblolly, shortleaf, pond, sand, and spruce pines. These are not used in the production of naval stores.
Pulping hardwoods:	Hardwood species that can be used in the manufacture of paper. They include the gums, bays, maples, poplars, and magnolia.
Nonpulping hardwoods:	Hardwood species that are not generally considered of value for the production of paper, such as oak, beech, elm, hackberry, hickory, ash, and cypress.

Table 3 classifies the total cordwood volume in the area by tree-species groups and forest type groups. The importance of the loblolly and shortleaf pine types, which account for 43 percent of the total cordwood volume, is at once apparent. Since this

same type group occupies only 32 percent of the total forest area, its cordwood volume per acre is above the average. In contrast, the longleaf and slash pine type, which occupies 45 percent of the productive forest area, bears less than 30 percent of the cordwood volume. The combined pine types comprise approximately 80 percent of the total cordwood volume of pulping species.

TABLE 3. -- *Cordwood volume* [1] *in pulping and nonpulping species groups by forest type groups*

Tree species groups	Forest type groups designated by predominant species			Total	Percent of total volume
	Longleaf and slash pine	Loblolly and shortleaf pine	Hardwood		
	Thousands of cords [2]				
Pulping species:					
Turpentine pines: [3]					
Round	7,744	421	69	8,234	16.6
Working and idle	3,073	55	19	3,147	6.3
Worked-out	487	11	8	506	1.0
Nonturpentine pines: [4]	682	15,013	476	16,171	32.4
Total pines	11,986	15,500	572	28,058	56.3
Hardwoods [5]	1,789	3,088	6,844	11,721	23.4
Total pulping	13,775	18,588	7,416	39,779	79.7
Nonpulping hardwoods [6]	1,164	2,851	6,092	10,107	20.3
Total all species	14,939	21,439	13,508	49,886	100.0
Percent of total volume	29.9	43.0	27.1	100.0	

[1] Gross volume; woods cull has not been deducted. It is believed that final computations will indicate deductions of between 3 and 6 percent for woods cull.
[2] To convert to full number of cords add "000".
[3] Longleaf and slash pines.
[4] Loblolly, shortleaf, sand and spruce pines, cedar.
[5] Gum, bay, yellow poplar, magnolia, maple, and associated minor species.
[6] Cypress, oak, hickory, beech, ash, elm, hackberry, and associated minor species.

Tables 4 and 5 indicate to some extent the status of wood volume in relation to its use for pulpwood. The volumes shown in table 4 are those in pulping species for which the naval stores industry has no use; the trees either have been worked out and abandoned for further operations, or they are of species not used for naval stores. Table 5 shows the wood volume in (1) trees that are not subject to be cut in the immediate future either because they are being worked for naval stores now, or because they are likely to be so worked before being released for cutting; and in (2) tree species not suited for the production of pulp.

TABLE 4. -- *Cordwood volume*[1] *in worked-out turpentine pine, nonturpentine pine, and pulping hardwood species, by tree diameter classes and forest type groups*

Tree species groups	Tree diameter classes[2]	Forest type groups designated by predominant species			Total	Percent of total volume
		Longleaf and slash pine	Loblolly and shortleaf pine	Hardwood		
	Inches[3]	*Thousands of cords*[4]				
Worked-out turpentine pines[5]	6" - 8"	45	1	-	46	.2
	10" - 12"	176	2	2	180	.6
	14" - 18"	219	8	6	233	.8
	20" & over	47	-	-	47	.2
Total worked-out turpentine pines		487	11	8	506	1.8
Nonturpentine pines[6]	6" - 8"	187	3,341	160	3,688	13.0
	10" - 12"	227	4,646	141	5,014	17.6
	14" - 18"	203	4,423	111	4,737	16.7
	20" & over	65	2,603	64	2,732	9.6
Total nonturpentine pines		682	15,013	476	16,171	56.9
Pulping hardwoods[7]	6" - 8"	703	856	1,306	2,865	10.1
	10" - 12"	633	995	1,670	3,298	11.6
	14" - 18"	362	923	2,180	3,465	12.2
	20" & over	91	314	1,688	2,093	7.4
Total pulping hardwoods		1,789	3,088	6,844	11,721	41.3
Total		2,958	18,112	7,328	28,398	100.0
Percent of total volume		10.4	63.8	25.8	100.0	

[1] Gross volume; woods cull has not been deducted. It is believed that final computations will indicate deductions of between 3 and 6 percent for woods cull.

[2] Nonturpentine pines and hardwoods were measured at 4-1/2 feet from the ground. Worked-out turpentine pines were measured above the turpentine-butt section, 10 feet from the ground.

[3] Trees ranging from 5.0 to 8.9 inches in diameter outside of bark are placed in the 6" - 8" class; corresponding limits apply to other diameter classes.

[4] To convert to full number of cords add "000".

[5] Longleaf and slash pines.

[6] Loblolly, shortleaf, sand and spruce pines, cedar.

[7] Gum, bay, yellow poplar, magnolia, maple, and associated minor species.

Table 4 shows that the area contains only a small volume of cordwood in worked-out turpentine pine trees, an indication that turpentining there has not as yet become a very extensive industry. The volume in round turpentine trees, as seen in table

5, is by contrast significantly large, which should make possible in the next few years an increased development in the naval stores industry. Table 4 also shows that most of the volume in nonturpentine trees is found in the 10- to 18-inch diameter classes. These trees can be made to support a continuous lumber industry in the area.

TABLE 5. -- *Cordwood volume*[1] *in round, working and idle turpentine pine, and in nonpulping hardwood species, by tree diameter classes and forest type groups*

Tree species groups	Tree diameter classes[2]	Forest type groups designated by predominant species			Total	Percent of total volume
		Longleaf and slash pine	Loblolly and shortleaf pine	Hardwood		
	Inches[3]	*Thousands of cords*[4]				
Turpentine pines:[5]						
Round	6" - 8"	2,762	89	25	2,876	13.4
	10" - 12"	2,692	123	19	2,834	13.2
	14" - 18"	1,697	133	17	1,847	8.6
	20" & over	593	76	8	677	3.2
Total		7,744	421	69	8,234	38.4
Working and idle	6" - 8"	463	4	3	470	2.2
	10" - 12"	1,245	22	8	1,275	5.9
	14" - 18"	1,185	24	8	1,217	5.6
	20" & over	180	5	-	185	.9
Total		3,073	55	19	3,147	14.6
Nonpulping hardwoods[6]	6" - 8"	666	1,084	1,254	3,004	14.0
	10" - 12"	276	741	1,255	2,272	10.6
	14" - 18"	152	671	1,700	2,523	11.7
	20" & over	70	355	1,883	2,308	10.7
Total		1,164	2,851	6,092	10,107	47.0
Total cordwood		11,981	3,327	6,180	21,488	100.0
Percent of total volume		55.7	15.5	28.8	100.0	

[1] Gross volume; woods cull has not been deducted. It is believed that final computations will indicate deductions of between 3 and 6 percent for woods cull.

[2] Round turpentine pines and hardwoods were measured at 4-1/2 feet from the ground. Working and idle turpentine pines were measured above the turpentine-butt setion, 10 feet from the ground.

[3] Trees ranging from 5.0 to 8.9 inches in diameter outside of bark are placed in the 6" - 8" diameter class; corresponding limits apply to other diameter classes.

[4] To convert to full number of cords add "000".

[5] Longleaf and slash pines.

[6] Cypress, oak, hickory, beech, ash, elm, hackberry, and associated minor species.

An integration of the lumber, naval stores, and pulp industries seems possible in this area because 76 percent of the wood volume that could be used for pulp or lumber is of species that cannot be used for naval stores, while the timber abandoned annually by the naval stores industry is also available for pulpwood and lumber. According to figures in tables 4 and 5, trees in the 6- to 12-inch diameter classes comprise 56 percent of the total cordage. They are growing rapidly and serve as a nucleus for the future timber crops on which the various wood-using industries must depend. If properly managed and protected, they should furnish an increasing supply of timber for pulpwood, lumber, and naval stores.

The relationship between cordwood volumes in the several tree-diameter classes is illustrated in figure 2. The chart shows that in most species groups the volume of wood is greater in the 10- to 12-inch classes than it is in the 14- to 18-inch classes; and that in the latter classes it is in turn greater than that of the 20-inch and over classes. These facts promise in-creasing crops of timber in the future, provided that the small trees are not prematurely removed from the stand.

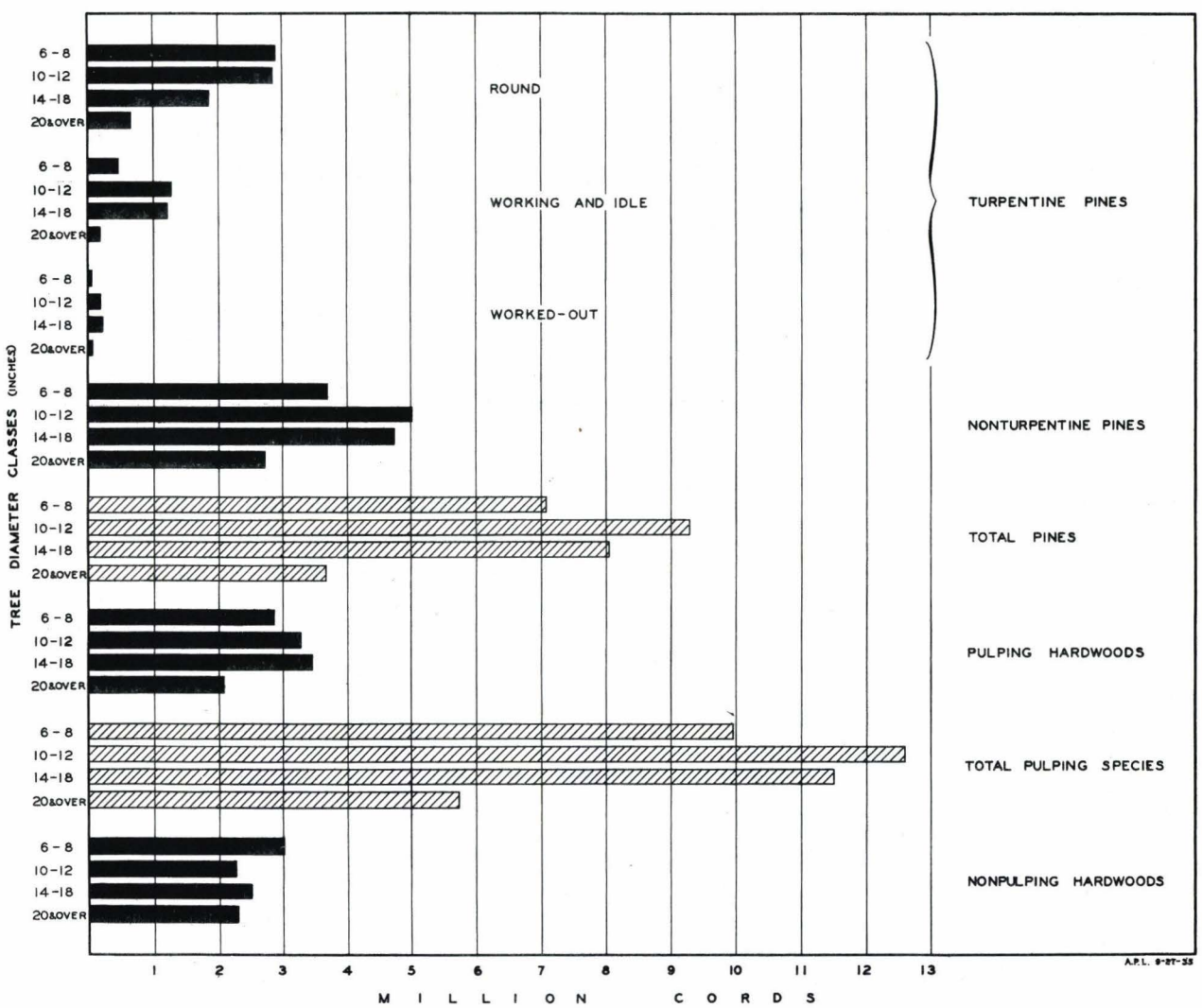

FIGURE 2. -- Classification of cordwood volume by species groups and tree-diameter classes. Round turpentine pines, nonturpentine pines, and hardwoods were measured from 4-1/2 feet above the ground. Working and idle turpentine pines were measured from the turpentine-butt section, 10 feet above the ground. Trees ranging from 5.0" - 8.9" in diameter outside of bark are placed in the 6" - 8" class; corresponding limits apply to the other diameter classes.

Table 6 classifies the cordwood volume for the average acre by species groups and tree-diameter classes. This average-acre volume is a theoretical figure derived

TABLE 6. -- *Cordwood volume* [1] *on the average acre of productive forest land by pulping and nonpulping species groups and tree diameter classes* [2]

Tree species groups	Tree diameters in inches [3]								Total all diameter classes	
	6" - 8"		10" - 12"		14" - 18"		20" & over			
	Cords	% of total	Cords	% of total	Cords	% of total	Cords	% of total	Cords	% of total
Pulping:										
Turpentine pine: [4]										
Round	.50	5.8	.49	5.6	.33	3.8	.12	1.4	1.44	16.6
Working and idle	.08	.9	.23	2.7	.21	2.4	.03	.3	.55	6.3
Worked-out	.01	.1	.03	.3	.04	.5	.01	.1	.09	1.0
Nonturpentine pine [5]	.64	7.3	.87	10.0	.83	9.5	.48	5.6	2.82	32.4
Total pine	1.23	14.1	1.62	18.6	1.41	16.2	.64	7.4	4.90	56.3
Hardwood [6]	.50	5.7	.58	6.7	.60	6.9	.36	4.1	2.04	23.4
Total pulping	1.73	19.8	2.20	25.3	2.01	23.1	1.00	11.5	6.94	79.7
Nonpulping hardwood [7]	.53	6.1	.40	4.6	.44	5.0	.40	4.6	1.77	20.3
Total all species	2.26	25.9	2.60	29.9	2.45	28.1	1.40	16.1	8.71	100.0

[1] Gross volume; woods cull has not been deducted. It is believed that final computations will indicate deductions of between 3 and 6 percent for woods cull.

[2] The 5,729,700 acres of productive forest area were used in finding the average acre.

[3] Round turpentine pines, nonturpentine pines and hardwoods, were measured at 4-1/2 feet from the ground. Working and idle and worked-out turpentine pines were measured above the turpentine-butt section, 10 feet from the ground. Trees ranging from 5.0 to 8.9 inches in diameter outside of bark are placed in the 6" - 8" diameter class; corresponding limits apply to other diameter classes.

[4] Longleaf and slash pines.

[5] Loblolly, shortleaf, sand and spruce pines, cedar.

[6] Gum, bay, yellow poplar, magnolia, maple, and associated minor species.

[7] Cypress, oak, hickory, beech, ash, elm, hackberry, and associated minor species.

by dividing the total volume for the area by the productive forest acreage. The table shows a volume of 8.71 cords of wood (without deduction for woods cull) on the average acre, of which nearly 80 percent is in pulping species. The pines alone contribute nearly 3 cords per acre from trees less than 13 inches in diameter, while the pulping hardwoods furnish another cord per acre from trees of the same diameter classes.

Summary

The extent of the Southwest Alabama survey area is over 8 million acres. Its surface relief is rolling to hilly and is well drained by numerous rivers and streams. More than 70 percent of the land area, or approximately 5,729,700 acres, is forest land. Mixed pine stands of longleaf, slash, loblolly, and shortleaf species occupy 78 percent of the forest area. The total cordwood volume is approximately 50 million cords, of which nearly 40 million are in pulping species. Loblolly and shortleaf pine account for 40 percent of the volume in pulping cordwood. Trees of pulping species under 13 inches in diameter aggregate 23 million cords, or over half the total pulping cordage. The average acre of productive forest area bears nearly 9 cords of wood, of which 5 are in pine species, 2 in pulping hardwoods, and 2 in nonpulping hardwoods.

The present existence in this area of lumber mills that operate on a continuous production basis, the possible future expansion in the wood pulp industry, and the probable increase in the scale of naval stores operation in the near future, afford an excellent opportunity, and also suggest the need, for introducing a high degree of integration among the major wood-using industries in order that all may operate upon a sustained-yield basis.

Errata

Page 6, line 10: Read "woods cull has not been made".
Page 10, line 14: Read "increasing".